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70. *N. graminea*, Del. One spec. from the East Indies labelled "*N. Indica*, Cham." The fruit is somewhat smaller than that of the original plant from Africa.

CYMODOCEÆ is represented by *Cymodocea* and *Halodule*.

71. *Cymodocea æquorea*. Kœnig. One spec. from India; another spec. so marked is doubtful.

72. *C. manatorum*, Asch. Spec. 1, Cuban coll. C. Wright, No. 3719.

73. *Halodule Wrightii*, Asch. Wright's Cuban coll., 3720. By some *Halodule* is regarded as only a sub-genus of *Cymodocea*. Neither has so far been found on our coast, but Cuba is so near that we may look for *Halodule* in our Southern waters.

EXPLANATION OF PLATE LIX.

Fig. 1. Side view of undenuded nutlet of *Potamogeton Wrightii*, Morong., $\times 12$.

Fig. 2. Nutlet split open, showing embryo, $\times 12$.

Fig. 3. Front view of nutlet, showing the lateral basal processes, $\times 12$.

Fig. 4. Nutlet, $\times 1\frac{1}{2}$.

Fig. 5. Leaf, natural size.

Synopsis of the Genus *Paspalum*.

BY DR. GEO. VASEY.

SECTION ANASTROPHUS, BENTH.

Spikelets rather distichous than secund, with the back of the flowering glume turned *outwards* or away from the rhachis.

1. *P. platycaule*, Poir.—Culms very slender, 6–18 inches high from a creeping rhizoma, peduncle long exerted, terminated by a pair of spikes (1 to 2 inches long) or 3 or 4 approximate slender spikes, and frequently with several long-peduncled lateral ones; spikelets single, elliptical-oblong, acutish or obtuse, outer glumes little longer than the flower, generally only two-nerved; leaves narrowly linear, smooth, obtuse, the sheaths much compressed.

2. *P. Michauxianum*, Kth. (*P. Digitaria*, Chap. non Poir.)—Larger and more robust; culms 1 to 2 feet high; leaves 3 to 6 inches long, wide, obtuse, smooth or hairy; sheaths compressed; spikes about 3, 2 to 4 inches long; spikelets rather distant, about

2 lines long; outer glumes lanceolate, acute, five to seven-nerved, one-third longer than the flowering glume.

Var. *VILLOSUM*; leaves and sheaths very villous.

SECTION EUPASPALUM, BENTH.

Spikelets more or less secund along the rhachis, with the back of the flowering glume turned *inwards* or toward the rhachis.

Subsection CERESIA, Benth.

Rhachis of the spikes membranaceous, dilated and applied close to, and nearly enclosing the flowers when mature.

3. *P. fluitans*, Kth.—Culms 1 to 3 feet long, from a creeping or floating rhizoma; leaves flat, broad linear; spikes numerous (40 to 50), alternate and verticillate, divaricate, slender, 2 to 2½ inches long; spikelets in two rows, ½ line long, oblong, pubescent.

Subsection OPISTHION, Benth.

Rhachis of the spikes flat, not dilated.

(a.) *Spikes digitate, in terminal pairs, or rarely 3 or 4.*

4. *P. conjugatum*, Berg.—Spikes divaricate, 2 to 5 inches long; spikelets very numerous (25 to 30 to the inch), secund, ovate, rather acute, hardly a line long, sterile glumes ciliate on the margins.

5. *P. notatum*, Flugge.—Culms rather stout; spikes thick, 2 to 3½ inches long, erect-spreading; spikelets ovate, *obtuse*, 1½ lines long, smooth, five-nerved.

6. *P. distichum*, Linn.—Culms erect from a creeping rhizoma, 6 inches to 2 feet high; leaves lanceolate, acute, *flat*, 2 to 3 lines wide; spikes little spreading, 1 to 2 inches long, not as thick as in *P. notatum*; spikelets oblong, acute or acutish, smooth, about 10 pairs to the inch.

7. *P. vaginatum*, Swz.—Culms from stout, creeping rootstocks, in wet ground or water, very leafy; leaves distichous, involute and pointed; sheaths loose; spikes 1 to 3 inches long, erect or spreading; spikelets oblong-lanceolate, acute, smooth; sterile glumes very *thin*, three to five-nerved, the lower *without midrib*. This species is united with the preceding by Benth.

(b.) *Spikes single and terminal, or one terminal and one (rarely more) additional, approximate, with sometimes axillary peduncled ones.*

8. *P. monostachyum*, Vasey in Chapm. Suppl. to Southern Flora.—Culm with spike 2 to 3 feet high, both rigidly erect;

spike 6 to 8 inches long; spikelets in pairs, very close, smooth, about $1\frac{1}{2}$ lines long, oblong, obtusish; occasionally with a long peduncled axillary spike, and sometimes the spikelets with a third small sterile glume.

9. *P. setaceum*, Michx. (*P. debile*, Michx.)—Culms 1 to $1\frac{1}{2}$ feet high, very slender; spikes long exerted, about 3 inches long and slender; spikelets in two rows, about $\frac{3}{4}$ inch long, very close; leaves narrow.

10. *P. ciliatifolium*, Muhl.—(*P. dasyphyllum*, Ell.)—Culms stouter, $1\frac{1}{2}$ to 2 feet high; leaves mostly longer and wider, smooth or hairy; spikes thicker; spikelets generally larger, and in two or three rows.

(c). Spikes 2 to 5, rarely more, not digitate.

* Spikelets 1 line long or less.

11. *P. caespitosum*, Flugge.—Culms $1\frac{1}{2}$ to 2 feet high, simple, leafy below; spikes 2 to 4, about 1 inch distant, 1 to $1\frac{1}{2}$ inches long, closely flowered; spikelets about half a line long, elliptical, minutely pubescent.

Var. LONGIFOLIUM, leaves smooth much longer and narrower.

12. *P. Walterianum*, Schultes.—Culms decumbent from a creeping rootstock, much branched; 1 to 2 feet long, smooth; leaves 3 to 4 inches long, acute, sheaths loose, the upper enclosing the lower spike; spikes 3 or more, approximate, with many from the lateral branches, 1 to $1\frac{1}{2}$ inches long; spikelets in two rows, ovate, 1 line long, smooth; rachis broadly winged, the margins partly covering the spikelets.

13. *P. lentiginosum*, Presl.—Culms 2 to 3 feet high, often branching below, joints smooth; sheaths long and loose; leaves 4 to 8 inches long, about $\frac{1}{2}$ inch wide; panicle 3 to 5 inches long; spikes 3 to 5, alternate, $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches apart, the lower ones 3 to 4 inches long, upper shorter; rachis subflexuous, very narrow; spikelets about a line long, in pairs, broadly oval; sterile glumes slightly puberulent, minutely punctate and brown spotted; generally with a minute third sterile glume as in *Panicum*, (350 Drummond, Texas.)

** Spikelets from 1 to $1\frac{1}{2}$ lines long.

14. *P. lividum*, Trin.—Culms 2 feet or more high, branching below, smooth; panicle about 4 inches long; spikes 4 to 5,

alternate, slightly spreading, 1 to $1\frac{1}{2}$ inches long; rhachis narrow, straight; spikelets in four rows, a little more than 1 line long, oval, acutish, smooth, *pale green*; sterile glumes three-nerved, a little longer than the flowering ones. (867 E. Hall, Texas.)

15. *P. præcox*, Walt. (*P. lentiferum*, Lam. ?).—Culms 2 to 3 feet high, simple, smooth; leaves long and narrow, smooth, or hairy below; panicle long exerted, 4 to 5 inches long; spikes 3 to 6, $1\frac{1}{2}$ to 2 inches long; rhachis straight and flat; spikelets in three or four rows, nearly orbicular, obtuse, 1 to $1\frac{1}{2}$ lines long; sterile glumes smooth, three-nerved.

Var. CURTISIANUM (*P. Curtisianum*, Steudel.), larger and stouter, spikes 6 to 8, spikelets large, leaves and sheaths hairy.

16. *P. læve*, Michx.—Culms 2 to 4 feet high, simple; panicle 3 to 6 inches long; spikes 3 to 5, rather slender, 2 to 4 inches long; rhachis narrow and flexuous; spikelets single in two rows, about $1\frac{1}{2}$ lines long, oval or nearly orbicular, smooth; sterile glumes smooth, five-nerved, (two very near the margin.)

Var. UNDULOSUM (*P. undulosum*, Le Conte), leaves flat, 4 to 6 inches long, 4 to 5 lines wide, the margins undulate.

Var. ANGUSTIFOLIUM, (*P. angustifolium*, Le Conte), leaves 6 to 10 inches long, narrow, spikes usually longer.

17. *P. plicatulum*, Michx.—Culms 2 to 3 feet high, rather slender, smooth, simple; panicle 3 to 5 inches long; spikes $1\frac{1}{2}$ to 3 inches long, rather slender; rhachis narrow, flexuous; spikelets in pairs, rather lax, forming 2 or 3 series, smooth, oval or obovate-elliptical, obtuse; sterile glumes about five-nerved, the second or flat one when mature with 2 to 3 transverse plications on each side near the margin; flowering glume brownish purple.

18. *P. remotum*, Remy. (?) (*P. Hallii*, V. & S.).—Culms 2 to 3 feet high, rooting at the lower joints and branching below, the nodes pubescent; panicle 3 to 4 inches long; spikes 3 to 6, approximate, rather thick, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long; rhachis wide, nearly straight; spikelets mostly in four rows, 1 to $1\frac{1}{2}$ lines long, ovate or oval, obtuse; sterile spikelets about five-nerved, pubescent, or nearly smooth. (804 E. Hall, Texas.)

Var. *glaucum*, Scribner.—Culms erect and more rigid, spikes 5 to 7, spikelets more elliptical.

Var. GLABRUM.—Culms decumbent and rooting at the base, spikelets smooth or nearly so.

19. *P. racemulosum*, Nutt.—Culms erect, 2 to 3 feet high, simple; leaves long, the lower ones with the sheaths white-hairy; panicle erect, 4 to 6 inches long; spikes generally 3, lax, few-flowered, 3 to 4 inches long; rhachis narrow and flexuous, spikelets in alternate pairs, distant, distinctly pedicelled, oblong-ovate, obtuse, about $1\frac{1}{2}$ lines long; sterile glumes smooth, seven-nerved.

20. *P. dilatatum*, Poir., (*P. ovatum*, Trin.)—Culms 3 to 4 feet high, simple, smooth; leaves lance-linear, acuminate, smooth; panicle 6 to 8 inches long, lax, cernuous; spikes 3 to 7, rarely more, 2 to 4 inches long, gradually shorter upwards, rather lax; rhachis smooth and straight; spikelets in four rows, compressed, ovate, acute; sterile glumes about $1\frac{1}{2}$ lines long, acute, five-nerved, longer than the obtuse flowering ones, the lower one with scattered silky hairs, especially on the margins.

Var. DECUMBENS; culms shorter and decumbent, the spikes usually 3 or 4.

*** Spikelets larger, $1\frac{1}{2}$ to 2 lines long.

21. *P. difforme*, Le Conte.—Culms erect, 2 to 3 feet high, simple, leafy near the base; leaves 4 to 6 inches long, about 4 lines wide, flat, upper surface and margins with scattered long hairs, which disappear with age, upper leaves very short; panicle short, of 2 or 3 rather dense spikes, $1\frac{1}{2}$ to 3 inches long; rhachis narrow and flexuous; spikelets mostly single and in two rows, oval-oblong, obtuse, $1\frac{1}{2}$ to nearly 2 lines long; lower sterile glume slightly scabrous, five-nerved. Intermediate between *P. læve* and *P. Floridanum*. (3,570, A. H. Curtiss distribution.)

22. *P. Floridanum*, Michx.—Culms erect, rigid, simple, tall; leaves long and narrow, hairy or smooth; spikes 2 to 6, thick, erect, 3 to 5 inches long; rhachis narrow and flexuous; spikelets in two to four rows, about 2 lines long, smooth, obtuse, ovate, three to five-nerved, finely reticulate-striate.

Var. TYPICA; leaves and sheaths rough hairy, spikes 2 to 3.

Var. *glabrata*, Englm.; leaves smooth, wider, spikes more numerous, usually 5 to 7.

23. *P. giganteum*, Baldw. (ined.)—Culms simple, erect, 3 to 5 feet high; leaves long and wide, the lower 18 inches long, and

nearly an inch wide; spikes 3 to 4, about 2 inches distant, spreading and becoming widely divergent, 5 to 8 inches long, and rigid; rhachis nearly straight; spikelets crowded, mostly in two rows, about two lines long, ovate, obtuse, smooth; sterile glumes five-nerved.

(d.) *Spikes more numerous—7 to 20.*

24. *P. purpurascens*, Ell.—Culms decumbent and ascending, 2 feet high, branching, glabrous; leaves long and rather broad, glabrous, or hairy near the base, more or less of a purplish hue, as are also the lower joints of the stem; panicle 4 to 6 inches long; spikes variable in number, 5 to 7, sometimes 10 to 12, rarely on poor specimens, or on the branches, 3 or 4, 2 to 3 inches long, closely flowered; rhachis straight, wide; spikelets mostly in four rows, crowded, about 1 line long, obovate, obtuse; sterile glumes five-nerved, smooth, of a livid hue; flowering glume becoming black.

25. *P. virgatum*, L., var. *PUBIFLORUM*.—Culms tall and stout, 3 to 4 feet high, smooth; leaves long and narrow, smooth, hairy at the throat, joints dark; panicle 6 to 9 inches long, virgate; spikes 12 to 25, erect and appressed, semi-verticillate, flexuous, the lower 3 to 4 inches long, diminishing upwardly; rhachis narrow, straight; spikelets about $1\frac{1}{2}$ lines long, acute, ovate, in four rows; sterile glumes white-hairy, especially on the margins, longer than the obtuse flowering glume.

SPECIES LITTLE KNOWN.

26. *P. elatum*, Richard.—Culms erect, sub-compressed, striate, glabrous; sheaths and leaves glabrous, the leaves linear, elongated, narrowly acuminate; spikes 5 to 7, sub-fasciculate, sessile, approximate, erect, or subfalcate spreading, elongated; spikelets in twos, short-pedicelled, narrowly obovate, twice as wide as the axis; glumes obovate, five-nerved, smooth. In Herb. Gray is a specimen from Key West, and another from Texas, (No. 364 Drummond.) The description is from Doell's Gram. Bras.

27. *P. BUCKLEYANUM*.—Culms decumbent at the base, simple, 2 to 3 feet high, smooth; leaves long and narrow, conduplicate; panicle 7 inches long, erect; spikes 6, alternate, erect or little spreading, 1 to $1\frac{1}{2}$ inches distant, the lower nearly 3 inches

long, upper $1\frac{1}{2}$ inches; rhachis straight; spikelets pale, in four rows, crowded, elliptical-oblong, acute, nearly $1\frac{1}{2}$ lines long; sterile glumes sparingly pubescent, three to five-nerved. This is described from a single specimen collected by Dr. Buckley in Texas. It is nearest to *P. lividum*, from which it differs in its longer panicle, with more numerous, longer and more distant spikes, and in the form and pubescence of the spikelets.

The Dehiscence of Fern Sporangia.

An easy and convenient method of studying the interesting process of the bursting of the sporangium in ferns is the following:

Place some sporangia from a mature sorus of any of the Polypodiaceæ (an herbarium specimen will do) in a drop of water on a slide and cover with a thin cover glass. The dehiscent sporangia will soon close; now examine their structure, especially the cells forming the annulus. Notice that their outer peripheral walls are much thinner than the inner and radial ones. Apply a drop of glycerine, chloriodide of zinc or sulphuric acid to one edge of the cover glass, and draw off the water by a piece of blotting paper at the opposite edge. While the water is slowly displaced by the reagent, concentrate the attention on the cells of the annulus; observe that the radial walls gradually approach each other, while the outer curve inward and finally double up. This decreases the size of the cells, and hence the length of the outer curve of the annulus; the latter gradually becomes straight, and finally recurved, so that the ends often touch one another. The tension exerted on the thin-walled portion of the sporangium by the straightening of the annulus has, meanwhile, caused it to burst. Suddenly, however, the cells of the annulus resume their former shape, it at once becomes straight, and the sporangium slowly assumes the shape which it had before it was placed in the water. If the cells of the annulus be now examined, it will be noticed that each contains an air-bubble almost entirely filling its cavity. If the reagent be replaced by water the bubbles will become globular, grow smaller and smaller and finally disappear. At the same time the annulus cells expand to their full size, the sporangium closes entirely and is now in the condition in which it